

## ON THE REMARKABLE VARIATION OF AN ORIENTAL HAWK-MOTH (LEPIDOPTERA).

By KARL JORDAN.

(With text-figures 76-79 and Plate III, figs. 3-6.)

A NEW subspecies of *Polyptychus trilineatus* Moore 1888 received from Celebes agrees so closely with the various other subspecies in colour and pattern and differs so markedly in the male genital armature that the re-examination of these organs in the entire species (as far as represented in the Tring collection) promised to be of interest. In order to be able to refer to the Celebes subspecies by name I insert here the description before giving an account of the variation of the species.

***Polyptychus trilineatus kalisi*** subsp. nov. (text-fig. 79; Pl. III, fig. 4).

Central-West Celebes: Gunong Tompoe, Paloe, 2,700 ft., i., ii. 1937 (J. P. A. Kalis), 2 ♂♂; 4 other ♂♂ obtained by Mr. Kalis in the Maros district, South-West Celebes, ii. 1938.

♂. As dark as fresh specimens of *P. t. undatus* (North India), the grey areas of forewing rather glossy and contrasting with the black areas; there is nothing definite in the pattern in which the subspecies differs from the others; the white transverse bar of hindmargin of hindwing close to anal angle (part of a discal line) more oblique than in Indian specimens, but that is also the case in the races from the Philippines and Andamans. The white colouring of underside variable in extent. Upperside of mid- and hindtibiae nearly entirely blackish, or more or less buff. Size as in ♂♂ from the Philippines and Andamans.

Genitalia: Anal tergite (X. t.) broader than in other subspecies, the apical hook broad, apically rounded; anal sternite (X. st.) a narrow ridge. Ventral division of clasper (Cl) ending in a single, strongly curved, hook. The pair of horns present in other subspecies below X. st. absent. Ventral process (ve) of penis-funnel straight in terminal half, with the apex subtruncate or irregularly rounded; right dorso-lateral process (ri) of penis-funnel very short, left process absent. Length of forewing 43-45 mm., width 17-19.5 mm.

We know now 9 subspecies:

- (1) *P. t. luteatus* R. & J., *Revis. Sphingidae*, p. 273 (1903), Ceylon.
- (2) *P. t. sonantis* Jord., *Nov. Zool.*, xxxvi, p. 2 (1930), South India.
- (3) *P. t. trilineatus* Moore, *Proc. Zool. Lond.*, p. 290 (1888), North-West India.
- (4) *P. t. undatus* R. & J., *l.c.* p. 238 (1903), North-East India.
- (5) *P. t. costalis* Mell, *Südchin. Sphing.*, ii, p. 130 (1922), South China.
- (6) *P. t. mincopicus* Jord., *l.c.* p. 3 (1930), Andaman Is.
- (7) *P. t. kelanus* Jord., *l.c.* p. 3 (1930), Sumatra.
- (8) *P. t. philippinensis* R. & J., *l.c.* p. 239 (1903), Philippine Is.
- (9) *P. t. kalisi* subsp. nov., Celebes.

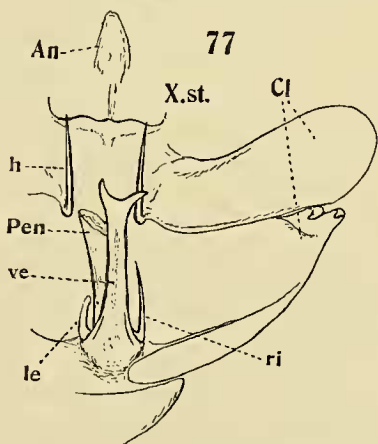
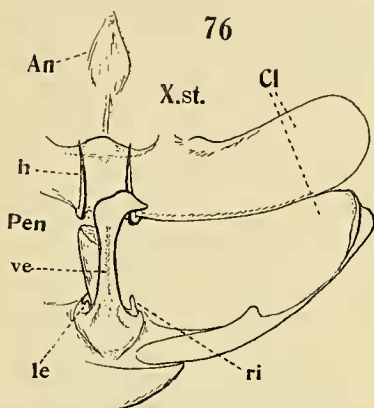
The species is not yet represented in the Tring collection from Formosa, West China, Indo-China, Burma, Siam, Malay Peninsula, Borneo, Palawan, Java, where it may certainly be expected to occur.

The hawkmoth described as *P. t. chinensis* R. & J. 1903 from China we now consider to be a distinct species; the mutilated ♀ on which the name was based is still the only example at Tring.

The genital armature of the ♂ is somewhat complicated, and in 1903 we were uncertain about the homology of some of the sclerites; the comparison of several subspecies discovered since has cleared up the doubtful points. In order to demonstrate *ad oculos* the interesting differences we give small diagrammatical figures of the organs of *P. t. luteatus* and of *P. t. undatus*, but omit terga IX and X, and for comparison with *P. t. kalisi* from Celebes we give a figure of equal size taken from a specimen of *P. t. philippinensis*. The 9 subspecies fall into 4 groups according to the development of the genital armature:

I. *P. t. luteatus*, Ceylon (text-fig. 76), and *P. t. sonantis*, South India.—

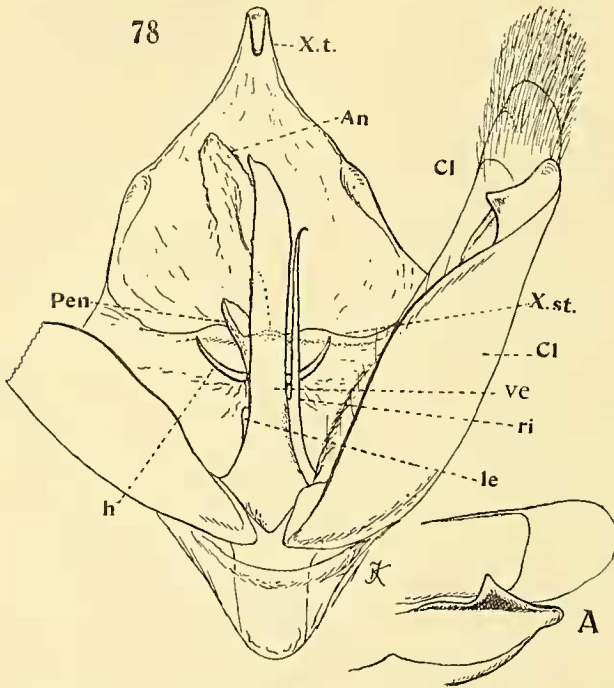
Tergum X shorter than in the other subspecies. Ventral division of clasper rounded at apex, with a slight sinus and on the concave inner surface a sharp ridge, more oblique and shorter in *luteatus* than in *sonantis*, swollen ventral margin with an upward projection, the pair of horns (h) below X. st. present; these horns are projections from the continuation mesad of the upper margin of the upper division of the clasper, and occur also in some other species of *Polyptychus*; in function they probably replace X. st., which is a low ridge and evidently of no great service in the lock and key arrangement of the sexes. Ventral process of penis-funnel (ve) widened at apex and here curved towards the right side (in *Revis. Sphing.*, pl. xxxiv, fig. 10, the process is seen from the upperside and points to the left, which is the right side of the body); the right dorso-lateral process (ri) is short and the left (le) still shorter in the specimen from which the figure is taken, but both may be entirely absent or vestigial.



II. *P. t. trilineatus*, North-West India, *P. t. undatus*, North-East India, *P. t. costalis*, South China, *P. t. mincopicus*, Andamans, *P. t. kelanus*, Sumatra.— The area of distribution of this group embraces no doubt all the countries from North India and China south and east as far as Borneo (and probably Palawan) and Java. Tergum X longer than in Group II; X. st. a narrow ridge (text-fig. 77). Ventral division of clasper (Cl) apically divided into two short, more or less pointed and curved, claw-like processes, which are different in the various subspecies of this group; ventral margin without projection about middle. The pair of horns (h) present. Ventral process (ve) of penis-funnel longer than in Group I, along middle membranous as in I, apically divided into two projections and resembling a fish-tail, the right projection longer or shorter than the left

according to subspecies ; right dorso-lateral process (ri) long, and the left much shorter.

III. *P. t. philippinensis*, Philippines. We have studied only the armature of Luzon males ; the Mindanao ♂ mentioned in the *Revision*, p. 240, may differ, and if that is the case, Mindoro specimens also will show differences ; we may, therefore, expect that at least three subspecies belong to this group.—X. t. with long and narrow apical hook. X. st. a narrow undulated ridge. Ventral division of elasper (Cl) with two lobes, one apical, rounded at apex, concave on inner surface, appearing in a view from inner side (text-fig. 78, A) narrower than in ventral aspect (text-fig. 78) ; the upper margin of this lobe gradually dilated upward into a triangular projection, the apex of which is smaller than 90°.



Pair of horns (h) present, rather strongly arched. Ventral process of penis-funnel (ve) long, at apex gradually narrowing to a point, lateral margins minutely denticulate, apex slightly turned towards the left, not to the right as in group I ; right process (ri) very long, reaching to apical fifth of broad process ; left process (le) indicated by a suture and a small notch, not separated from ventral process.

IV. *P. t. kalisi*, Celebes.—The distinctions have been given above ; the most remarkable differences being the broad apical hook of X. t., the absence of the pair of horns and the

abrupt narrowing of the apex of the ventral division of the clasper into a strongly chitinized single long hook (text-fig. 79). The ventral process (ve) of the penis-funnel has proximally a deep median channel. X. st. is a narrow ridge or fold which has the appearance of being pulled anad by the longitudinal median ridge which connects it with the anal cone (An). Similar subspecies probably occur on the Sula Is. and Buru. In one of the 4 specimens from the Maros district there is a small marginal tubercle some distance from the hook of the clasper.

The first point of general interest is the very striking contrast between the geographical modification of the colour and pattern on the one side and the male genital armature on the other. The female organs of copulation also are different in Groups I, II and III, but as we have no ♀ of Group IV, I abstain from referring to the structure of this sex. I find nothing in colour, pattern, size and wing-contour which quite definitely distinguishes one subspecies from all the others, or one group from the other. The 4 photographs, figs. 3-6, on Plate III illustrate

this statement; individuals, of course, are always different from each other in some way or other. The male genital armature, on the contrary, is so strongly modified in the 4 groups of subspecies that there would be great justification for treating each group as being a distinct species. It is obvious that the causes of evolution underlying the development of *P. trilineatus* into geographical modifications have affected the genital armature very strongly and the colour and pattern of the insect hardly at all; the one set of somaties has gone ahead and the other has remained stagnant, there being no co-ordination between them and no interdependence.

The groups of subspecies we are considering represent each other geographically just as do the subspecies within each group. The differences between the groups are large and those between the subspecies of groups I and II small—if in future Groups III and IV are found each to comprise several subspecies, what we have said of I and II will doubtless apply to all four. But the differences are of the same kind; it is a matter of degree. Each group inhabits an area known to be a major zoogeographical unit of the Oriental Region. The separation of one such unit from the other took place at an earlier

period than the separation of the minor divisions within these zoogeographical units, and we may look upon the 4 groups of *P. trilineatus* as representing the early development of the species into 4 subspecies. These were the ancestral subspecific divisions of *P. trilineatus*, which became further modified and, at a later period, themselves split up into subspecies. The process of evolution is here evident. The older the original area, the longer the isolation, the greater the differences of the subspecies.

Although the 4 groups may already have attained a degree of independence of each other which equals the independence existing between species that live side by side, we keep them as divisions of one species with the object to emphasize the process of their origin and at the same time to simplify classification.

Plate III, fig. 3, *P. t. sonantis*, South India, type.

Plate III, fig. 4, *P. t. undatus*, type.

Plate III, fig. 5, *P. t. philippinensis*, Luzon.

Plate III, fig. 6, *P. t. kalisi*, Celebes, paratype.

